IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Rakib et al.

Art Unit:

Examiner:

Serial No. unknown

Filed: 12/12/00

For: APPARATUS AND METHOD FOR SCDMA DIGITAL DATA TRANSMISSION USING ORTHOGONAL CODES AND A HEAD END MODEM WITH NO TRACKING LOOPS

- -

Honorable Commissioner
of Patents and Trademarks
Washington, D.C. 20231

Morgan Hill, California
December 12, 2000

PRELIMINARY AMENDMENT

Dear Sir:

Before examining the above identified patent application, please amend the above identified case as follows.

IN THE CLAIMS

Please cancel claims 1-83 of the parent application and add the following new claims.

84. A remote unit modem to transmit digital data upstream to a headend modem comprising:

a digital data receiver for receiving downstream digital data transmitted from a headend modem modulated by any modulation scheme, said downstream digital data either encoding a master clock generated at said headend modem in payload data or other data, said master clock being used to transmit said downstream data, or said downstream data including said master clock as well as payload data, said digital data receiver functioning to recover said downstream payload data and said master clock and generating an upstream clock from said recovered master clock;

a digital data transmitter for coupling to a source of upstream digital

payload data from one or more sources, and coupled to receive said upstream clock generated from said recovered master clock and using said upstream clock to transmit known preamble data and, subsequently, transmitting said upstream payload digital data using any modulation method, and, if necessary to separate upstream payload data from several upstream data sources, using any multiplexing method.

85. The apparatus of claim 84 wherein said upstream payload data is organized as frames, and further comprising means in said transmitter for carrying out a ranging process prior to transmitting said upstream payload data to determine a value for an upstream frame timing delay which is used to transmit each upstream frame from this transmitter which will cause said upstream frame to arrive at said headend modem with its frame boundaries aligned in time with upstream frames transmitted from other remote unit modem transmitters.

86. The apparatus of claim 85 wherein said transmitter includes a precode filter and receives upstream payload data from different sources and code division multiplexes data from each source using different spreading codes from an orthogonal, cyclic code set, and further comprising means for performing equalization training after frame synchronization has been achieved so as to determine coefficients to set into said precode filter to predistort transmissions from said transmitter to reduce or eliminate channel distortion.

87. The apparatus of claim 86 wherein said means for performing equalization training further comprises means for checking the accuracy of frame synchronization and adjusting said transmit frame timing delay if necessary.

88. The apparatus of claim 86 wherein said means for performing equalization training further comprises means for adjusting the power level of transmissions from this transmitter to achieve power alignment such that transmissions from this transmitter arrive at said headend modem at approximately the same power level as

transmissions from remote unit modems.

89 . The apparatus of claim 87 wherein said transmitter includes a quadrature amplitude modulation modulator to use QAM modulation to transmit said upstream payload data, and wherein said means for performing equalization training further comprises means for adjusting the power level of transmissions from this transmitter to achieve power alignment such that transmissions from this transmitter arrive at said headend modem at approximately the same power level as transmissions from remote unit modems.

90. The apparatus of claim 84 wherein said transmitter includes shaping filters which have transfer functions which are the Hilbert transfer function of each other so as to filter upstream transmissions to achieve carrierless modulation.

91. The apparatus of claim 90 wherein said shaping filters have transfer functions so as to filter upstream transmissions to limit their bandwidth to 6 MHz centered around a center frequency.

92. The apparatus of claim 90 wherein said shaping filters have squared raised cosine filter transfer functions so as to filter upstream transmissions to satisfy the Nyquist criteria to optimize signal-to-noise enhancement and minimize intersymbol interference.

93. The apparatus of claim 90 wherein said shaping filters are digital and programmable so as to have adjustable filter transfer functions so as to filter upstream transmissions to satisfy the Nyquist criteria to optimize signal-to-noise enhancement and minimize intersymbol interference.

94. The apparatus of claim 84 wherein said transmitter receives upstream payload data from multiple sources and includes a code division multiplexer which functions to code division multiplex data from each source using different spreading

codes from a spreading code set.

95. The apparatus of claim 84:

wherein said remote unit modem is one of a plurality of remote unit modems all of which share a common upstream data path to transmit data to said headend modem in frames,

and wherein said

and wherein said transmitter in said remote unit modem functions to receive upstream payload data from multiple sources and transmit said upstream payload data in frames,

and wherein said transmitter further comprises ranging means for determining a transmit frame timing delay which, when imposed, causes each upstream transmitted frame to arrive at said headend modem with its frame boundaries aligned in time with the frame boundaries of other upstream payload data frames transmitted from said other remote unit modems,

and wherein said transmitter includes a code division multiplexer which functions to code division multiplex upstream payload data from each source using different spreading codes from a spreading code set.

96. The apparatus of claim 84:

wherein said remote unit modem is one of a plurality of remote unit modems all of which share a common upstream data path to transmit data to said headend modem in frames,

and wherein said digital data receiver receives downstream payload data transmitted in frames from said headend modem and includes means to recover said master clock from downstream frame marker data transmitted to mark the beginning of every downstream frame, said downstream frame marker encoding said master clock;

and wherein said transmitter in said remote unit modem functions to receive upstream payload data from multiple sources and transmit said upstream payload data in frames,

and wherein said transmitter further comprises ranging means for determining a transmit frame timing delay which, when imposed, causes each upstream transmitted frame to arrive at said headend modem with its frame boundaries aligned in time with the frame boundaries of other upstream payload data frames transmitted from said other remote unit modems.

97. The apparatus of claim 96 wherein said downstream frame marker is a barker code or any other signal with good autocorrelation properties.

98. The apparatus of claim 96 wherein said transmitter includes circuitry to generate an upstream carrier from said recovered master clock which is of the same frequency as a downstream carrier used by said headend modem to transmit downstream payload data, and wherein said transmitter includes means to modulate said upstream payload data onto said upstream carrier for transmission.

99. The apparatus of claim 84 wherein said digital data receiver receives downstream payload data transmitted in frames from said headend modem and includes means to recover said master clock from downstream frame marker data transmitted to mark the beginning of every downstream frame, said downstream frame marker encoding said master clock.

100. The apparatus of claim 84 wherein said digital data receiver receives downstream payload data transmitted in frames from said headend modem and includes means to recover said master clock from pilot channel data transmitted on a downstream management and control channel, and wherein said transmitter or said receiver includes circuitry to either recover a master clock used to transmit downstream payload data from said pilot channel data and synchronize an upstream carrier to said recovered master carrier or use said recovered master clock to generate an upstream carrier which is phase coherent therewith.

101. The apparatus of claim 84 wherein said digital data receiver receives

downstream payload data transmitted in frames from said headend modem and includes means to recover said master clock from downstream frame marker data transmitted to mark the beginning of every downstream frame, said downstream frame marker data encoding said master clock, and wherein said receiver or transmitter includes means to generate an upstream carrier from said recovered master clock, and wherein said downstream frame marker data is any signal which has good autocorrelation properties including a barker code.

102. The apparatus of claim 84 wherein said digital data receiver receives downstream payload data transmitted in frames from said headend modem and includes means to recover said master clock from downstream frame marker data transmitted to mark the beginning of every downstream frame, said downstream frame marker data encoding said master clock, and wherein said receiver or transmitter includes means to recover data transmitted by said headend modem from which a kiloframe marker can be generated such that said downstream frames can be counted by said remote unit modem, and wherein said transmitter and/or receiver includes means for counting received downstream frames and for counting upstream frames transmitted by said remote unit modem, and for carrying out boundless ranging by receiving a frame from said headend modem having any frame number and responding by sending back a response frame which includes a total turnaround time service request and the frame number of the downstream frame just received, and for receiving back a frame which includes the total turnaround time for said remote unit modem in the form of the difference between the headend modem's downstream frame count at the time said response frame is received and the downstream frame number included in the response frame, and said transmitter including means for using said total turnaround time along with spreading code assignments transmitted to said remote unit modem from said headend modem so as to use the proper spreading codes to spread the spectrum of data during specific upstream frames.

103. The apparatus of claim 84 wherein said transmitter comprises:

a framer circuit functioning to receive said multiple streams of said

digital upstream payload data and interleave said data into a plurality of frames, said framer circuit outputting one or more information vectors per frame, said information vectors containing data from said input streams of digital upstream payload data;

a code division multiple access multiplexer circuit functioning to receive said information vectors and spread the Fourier spectrum thereof using orthogonal spreading codes to perform a coding transformation so as to generate one or more symbols from each information vector having a spread power spectrum;

a modulator for using said one or more symbols to modulate one or more radio frequency carriers for transmission to said headend modem.

104. The apparatus of claim 84 wherein said transmitter comprises:

a framer circuit functioning to receive said multiple streams of said digital upstream payload data and interleave said data into a plurality of frames, said framer circuit outputting one or more information vectors per frame, said information vectors containing data from said input streams of digital upstream payload data organized as individual elements, each element comprised of a plurality of bits;

a trellis encoder coupled to receive said information vectors and trellis encode each element to add redundant bits that can be used at said headend modem to recover said data elements and correct for reception errors caused by channel impairments, said trellis encoder outputting trellis encoded information vectors;

a code division multiple access multiplexer circuit functioning to receive said trellis encoded information vectors and spread the Fourier spectrum thereof using orthogonal spreading codes to perform a coding transformation so as to generate one or more symbols from each information vector having a spread power spectrum; and

a carrierless shaping filter modulator comprised of a first filter to passband filter the spread spectrum resulting from code division multiplexing of said real information vectors to pass only a first passband of predetermined

limited bandwidth and center frequency and further comprised of a second filter having a filter transfer function which is the Hilbert transform of the transfer function of said first filter and functioning to passband filter the spread spectrum resulting from code division multiplexing of said imaginary information vectors to pass only a first passband of predetermined limited bandwidth and center frequency.

105. The apparatus of claim 104 further comprising means in said receiver and said transmitter for receiving code assignment messages from said headend modem specifying which particular spreading codes are to be used at specific times, and for controlling said code division multiple access multiplexer to use the assigned spreading codes at the assigned times.

106. The apparatus of claim 104 further comprising means in said receiver and said transmitter for receiving code assignment messages from said headend modem specifying which particular spreading codes are to be used at specific times, and for controlling said code division multiple access multiplexer to use the assigned spreading codes at the assigned times.

107. The apparatus of claim 84 wherein said transmitter includes means for receiving one or more input streams of upstream data which may be on separate conductors or in separate timeslots of a time division multiplexed stream, and for interleaving data from different streams or from different times in the same stream into each of a plurality of elements of one or more information vectors, and wherein said transmitter further comprises means for encoding each element of each information vector with a predetermined number of error correction bits.

108. The apparatus of claim 84 wherein said transmitter includes means for receiving one or more input streams of upstream data which may be on separate conductors or in separate timeslots of a time division multiplexed stream, and for interleaving data from different streams or from different times in the same stream into

each of a plurality of elements of one or more information vectors.

109. The apparatus of claim 84 wherein said transmitter includes comprises means for encoding each element of each information vector with a predetermined number of error correction bits.

110. The apparatus of claim 84 wherein said remote unit modem includes a code division multiplexer and means for implementing code diversity.

111. The apparatus of claim 102 wherein said digital data transmitter is a spread spectrum transmitter, and wherein said receiver further comprises means to recover downstream code allocation messages transmitted by said headend modem that define which spreading codes are to be used by said remote unit modem during particular upstream frames, and wherein said transmitter further comprises means for using the assigned spreading codes to spread the spectrum of said upstream data during the upstream frames designated in said downstream messages.

112. A method of transmitting digital data upstream to a headend modem comprising:

receiving downstream digital data transmitted from a headend modem modulated by any modulation scheme, said downstream digital data either encoding a master clock generated at said headend modem in payload data or encoded in other data, said master clock being used to transmit said downstream data, and recovering said downstream payload data and said master clock and generating an upstream clock from said recovered master clock;

receiving upstream digital payload data from one or more sources, and receiving said upstream clock generated from said recovered master clock and using said upstream clock to transmit known preamble data and, subsequently, using said master clock and at least one upstream carrier to transmit said upstream payload digital data using any modulation method, and, if necessary to separate upstream payload data from several upstream data sources or

transmitted from more than one remote unit modem, using any multiplexing method.

113. The method of claim 112 further comprising the steps of recovering a master carrier from pilot channel data transmitted by said headend modem and using said recovered master carrier to synchronize a local upstream carrier, and modulating said upstream payload data onto said local upstream carrier.

114. The process of claim 112 further comprising the steps of generating a local upstream carrier from said recovered master clock, and modulating said upstream payload data onto said local upstream carrier.

115. The process of claim 112 further comprising the steps of code division multiplexing said upstream payload data prior to modulation onto said upstream carrier.

116. The process of claim 113 further comprising the steps of code division multiplexing said upstream payload data prior to modulation onto said upstream carrier.

117. The process of claim 114 further comprising the steps of code division multiplexing said upstream payload data prior to modulation onto said upstream carrier.

118. The process of claim 112 further comprising the steps of organizing said upstream payload data as frames, and carrying out a ranging process prior to transmitting said preamble data and said upstream payload data, said ranging process for determining a value for an upstream frame timing delay which is used to transmit each upstream frame from said remote unit modem which will cause said upstream frame to arrive at said headend modem with its frame boundaries aligned in time with upstream frames transmitted from other remote unit modems so as to achieve frame synchronization.

119. The process of claim 117 further comprising the steps of organizing said

upstream payload data as frames, and carrying out a ranging process prior to transmitting said preamble data and said upstream payload data, said ranging process for determining a value for an upstream frame timing delay which is used to transmit each upstream frame from said remote unit modem which will cause said upstream frame to arrive at said headend modem with its frame boundaries aligned in time with upstream frames transmitted from other remote unit modems.

120. The process of claim 119 further comprising the steps of receiving upstream payload data from different sources and code division multiplexing said upstream payload data using spreading codes from an orthogonal, cyclic code set, and performing equalization training after frame synchronization has been achieved so as to determine coefficients to set into a precode filter to predistort transmissions from said transmitter to reduce or eliminate channel distortion.

121. The process of claim 118 further comprising the steps of checking that proper frame synchronization still exists by transmitting training data on a predetermined training orthogonal spreading code, and for adjusting said transmit frame timing delay if proper frame synchronization does not still exist by receiving adjustment data from a spread spectrum receiver in said headend modem that causes said remote unit modem to either adjust the transmit frame timing delay thereof by a specified amount or to re-perform a fine tuning ranging process to adjust the transmit frame timing delay thereof to achieve precise frame synchronization, and further comprising the step of adjusting the power level transmitted by said remote unit modem such that its transmitted power level arrives at said spread spectrum receiver in said headend modem at approximately the same power level as transmissions from all other remote unit modems transmitting to the same headend modem.

122. The process of claim 120 further comprising the steps of adjusting the power level of transmissions from this transmitter to achieve power alignment such that transmissions from this transmitter arrive at said headend modem at approximately the same power level as transmissions from remote unit modems.

123. The process of claim 120 wherein said step of using said master clock and at least one upstream carrier to transmit said upstream payload digital data using any modulation method comprises using quadrature amplitude modulation to transmit said upstream payload data on two carriers of the same frequency but offset in phase by 90 degrees from each other, and further comprising the step of adjusting the power level of transmissions from this transmitter to achieve power alignment such that transmissions from this transmitter arrive at said headend modem at approximately the same power level as transmissions from remote unit modems.

124. A remote unit modem to transmit digital data upstream to a headend modem comprising:

a digital data receiver for receiving downstream digital data transmitted in frames from a headend modem modulated by any modulation scheme, said digital data receiver functioning to recover said downstream payload data and a downstream frame marker signal and functioning to output said downstream data;

a digital data upstream transmitter for coupling to a source of upstream digital payload data having a first clock rate from one or more sources and organizing upstream digital payload data into upstream frames of the same length as said downstream frames, and having ranging means for transmitting a ranging signal at various trial and error transmit frame timing delay values and receiving messages back from said headend modem that are used to adjust said transmit frame timing delay value until a value is found which causes frame synchronization to exist, frame synchronization being defined as the arrival of upstream frames at said headend modem with their frame boundaries aligned in time with the frame boundaries of upstream frames transmitted from other remote unit modems to said head end modem, said upstream transmitter for generating a chip clock at a much higher rate than said first clock rate and for generating an upstream carrier and for using said chip clock to multiply one or more orthogonal spreading codes times the upstream data in one or more upstream frames to generate one or more upstream frames of spread spectrum

data and for transmitting said frames of upstream spread spectrum payload digital data using any modulation method and the transmit frame timing delay which caused frame synchronization to exist.

125. The apparatus of claim 124 further comprising training means for, from time to time, checking the continued accuracy of the frame synchronization and for cooperating with said head end modem to adjust said frame synchronization when necessary, and for cooperating with said head end modem to adjust the power level of transmissions by said remote unit modem such that transmissions therefrom arrive at said head end modem at approximately the same power level as transmissions from other remote unit modems, and for cooperating with said head end modem to adjust FFE and DFE filter coefficients in said upstream transmitter to predistort upstream data transmissions to compensate for channel impairments.

126. The apparatus of claim 124 further comprising interleaving means for interleaving said upstream payload data over time to form a plurality of information vectors for each upstream frame, each information vector comprised of a plurality of elements, each element comprised of one or more bits of said upstream payload data.

127. The apparatus of claim 124 further comprising interleaving means for interleaving said upstream payload data over time to form a plurality of information vectors for each upstream frame, each information vector comprised of a plurality of elements, each element comprised of one or more bits of said upstream payload data.

128. The apparatus of claim 126 further comprising error correction encoding means for receiving said information vectors and encoding said information vectors with error detection and correction bits.

129. The apparatus of claim 127 further comprising Trellis encoder means for receiving said information vectors and encoding each element of said information vectors

with redundant error detection and correction bits.

130. The apparatus of claim 130 further comprising Trellis encoder means for receiving said information vectors and encoding each element of said information vectors with redundant error detection and correction bits, and for dividing the resulting bits into real and imaginary components to generate real and imaginary information vectors from each said information vectors, each said real and imaginary information vector comprised of the same number of elements as there were elements in the information vector from which it was generated, and wherein said upstream transmitter multiplies said orthogonal spreading code at the chip clock rate times each said element of each said real and imaginary information vector to generate real and imaginary result vectors each comprised of a plurality of chips, and wherein said upstream transmitter has circuitry to use said chips of said real and imaginary result vectors to define quadrature amplitude modulation constellation points and transmit said constellation points using carrierless modulation.

131. The apparatus of claim 130 further comprising means to implement at least a normal mode and fallback mode for the Trellis encoding.

132. A process of bidirectional digital data communication carried out by remote unit modem to exchange digital data transmissions with a headend modem comprising the steps of:

receiving downstream digital data transmitted in frames from a headend modem modulated by any modulation scheme;

recovering said downstream payload data and a master clock encoded in a downstream frame marker signal;

presenting said downstream data at an output;

receiving upstream digital payload data having a first clock rate from one or more sources;

organizing upstream digital payload data into upstream frames of the same length as said downstream frames;

transmitting a ranging signal at various trial and error transmit frame timing delay values;

receiving messages back from said headend modem that are used to adjust said transmit frame timing delay value until a value is found which causes frame synchronization to exist, frame synchronization being defined as the arrival of upstream frames at said headend modem with their frame boundaries aligned in time with the frame boundaries of upstream frames transmitted from other remote unit modems to said head end modem;

generating a chip clock that is phase coherent with said recovered master clock and at a much higher rate than said first clock rate;

generating an upstream carrier that is phase coherent with said recovered master clock;

using said chip clock to multiply one or more orthogonal spreading codes times the upstream data in one or more upstream frames to generate one or more upstream frames of upstream spread spectrum payload data;

transmitting said frames of upstream spread spectrum payload digital data using any modulation method and said upstream carrier, and using the transmit frame timing delay in transmitting each upstream frame which caused frame synchronization to exist.

133. The process of claim 132 further comprising the steps of:

from time to time, checking the continued accuracy of the frame synchronization; and

cooperating with said head end modem to adjust said frame synchronization when necessary;

cooperating with said head end modem to adjust the power level of transmissions by said remote unit modem such that transmissions therefrom arrive at said head end modem at approximately the same power level as transmissions from other remote unit modems; and

cooperating with said head end modem to adjust filter coefficients in said upstream transmitter to predistort upstream data transmissions to compensate

for upstream channel impairments.

134. The process of claim 132 further comprising the step of interleaving said upstream payload data over time to form a plurality of information vectors for each upstream frame, each information vector comprised of a plurality of elements, each element comprised of one or more bits of said upstream payload data.

135. The process of claim 133 further comprising the step of interleaving said upstream payload data over time to form a plurality of information vectors for each upstream frame, and Trellis encoding each element to add redundant error correction bits and map each element into corresponding inphase and quadrature elements of corresponding inphase and quadrature information vectors and code division multiplexing each inphase and quadrature information vector.

136. The process of claim 132 wherein the step of organizing upstream digital payload data into upstream frames of the same length as said downstream frames further comprising the steps of organizing each said upstream frame as one or more information vectors and encoding said information vectors with error detection and correction bits.

137. The process of claim 135 wherein the step of using said chip clock to multiply one or more orthogonal spreading codes times the upstream data in one or more upstream frames comprises code division multiplexing each of said inphase and quadrature information vectors to generate inphase and quadrature result vectors, and wherein said step of transmitting said frames of upstream spread spectrum payload digital data using any modulation method comprises the steps of using said inphase and quadrature result vectors to set the information content of two quadrature amplitude modulated radio frequency signals formed by carrierless modulation using two shaping filters having filter transfer functions which are the Hilbert transform of one another.

138. The process of claim 132 further comprising the steps of:

interleaving upstream payload data to form one or more information

vectors for each upstream frame;

Trellis encoding each element of said information vectors with redundant error detection and correction bits;

mapping the resulting bits into real and imaginary components of constellation points to generate real and imaginary information vectors from each said information vectors, each said real and imaginary information vector comprised of the same number of elements as there were elements in the information vector from which it was generated;

multiplying said elements of said real and imaginary information vectors by one or more said orthogonal, cyclic spreading codes at the chip clock rate times to generate real and imaginary result vectors each comprised of a plurality of chips;

using said chips of said real and imaginary result vectors to generate upstream signals to transmit using carrierless quadrature amplitude modulation;

transmitting said upstream signals to said headend modem over a cable television hybrid fiber coaxial cable transmission medium which is simultaneously carrying downstream analog cable television signals and downstream digital data without interfering therewith by using frequency division multiplexing between said upstream and said downstream.

139. A process comprising:

in each remote unit modem of a distributed bidirectional digital data communication system having a plurality of remote unit modems coupled by a shared transmission media to a central unit modem which uses a master clock and a master carrier which is generated from said master clock to transmit downstream data to said remote unit modems, recovering at least said master clock and using said recovered master clock to generate local clock and carrier signals which are phase coherent with said master clock, said local carrier also being of the same frequency as said master carrier, and using said local clock and local carrier signals to recover downstream data, and using said local clock and carrier signals in each said remote unit modem to transmit

known upstream preamble data followed by upstream payload data received at said remote unit modem.

140. A remote unit transceiver in a distributed communication system having said central unit transceiver coupled by a shared transmission media to a plurality of remote unit transceivers said central unit transceiver using a master clock and master carrier signals to transmit downstream data to said remote unit transceivers, comprising:

a receiver for recovering said master clock and master carrier signals and using them to receive said downstream data and to synchronize local clock and carrier signals, respectively; and

a transmitter for receiving upstream payload data and for using said synchronized local clock signal and said synchronized local carrier signal to transmit known preamble data to said central unit modem then to transmit said upstream payload data using any form of multiplexing and any form of modulation.

141. A transmitter for use in a distributed digital data communication system comprised of a plurality of physically distributed transmitters coupling to a shared transmission medium which transmit data to a headend receiver, comprising:

any code division multiplexed or time division multiplexed transmitter for transmitting one or more upstream frames of data comprised of preamble data followed by payload data in frames to said headend receiver;

ranging circuitry including a programmed microprocessor for carrying out a ranging process to center a ranging signal in a gap between frames of upstream data transmitted by other transmitters which have already achieved frame synchronization such that their frames arrive at said headend receiver with their frame boundaries aligned in time, said ranging process resulting in determination of a transmit frame timing delay for use by said transmitter which causes frame synchronization to occur.

142. A method for communicating in a distributed digital data communication system having a plurality of remote unit transceivers coupled by a shared transmission medium to a central unit transceiver, comprising:

transmitting one or more ranging signals from a remote unit transceiver to said central unit transceiver with trial and error adjusted transmit frame timing delay values;

receiving one or more ranging messages from said central unit transceiver the content of which assist in a ranging process to achieve frame synchronization;

receiving a downstream frame marker signal from said central unit transceiver that has a master clock encoded therein;

transmitting to said central unit transceiver known preamble data followed by frames of upstream data using an upstream clock rate which is derived from said master clock encoded in said frame marker signal.

143. The method of claim 142 further comprising the steps:

after frame synchronization has been achieved, transmitting to said central unit transceiver one or more iterations of training data having its spectrum spread by a plurality of adjacent, orthogonal, cyclic spreading codes for use in power alignment and upstream equalization and a check on the continued existence of frame synchronization;

receiving a gain message from said central unit transceiver for use in setting transmit power levels by said remote unit transceiver; and

receiving at a remote unit transceiver an equalization coefficient message containing filter coefficients for use in setting equalization filter coefficients in said remote unit modem; and

receiving one or more messages from said central unit modem containing data indicating whether frame synchronization continues to exist.

REMARKS

Please examine the above new claims.

Respectfully submitted,

Dated: December 12, 2000

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